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Original Research Article

Evaluation of brain CT-scan results and indications before lumbar puncture in children suspected of meningitis hospitalized in Ardabil city hospital

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ABSTRACT

Background: Multiple use of CT scan is associated with an increased risk of cancer in the future especially in children due to cellular growth and mutation. The aim of this study was to evaluate the result and indications of brain CT scan before lumber puncture in children with suspected of meningitis.
Methods: In this retrospective cross-sectional study, information of brain CT Scans on all meningitis suspected children under 12 years old hospitalized in Ardabil city hospital at 2016 who were candidates of CT Scan before Lumbar Puncture were extracted and the results were analyzed by statistical methods in SPSS version 22.
Results: In this study, a total number of 67 patients were studied and CT scan changes were seen in 13 cases (19.4%) that of them 6 (46.2%) were male and rest of them were female. The mean age of the cases that had CT scan changes was 36.9±2.14 months and in other patients were 38.8±3.56 months. Of all patients, 13 patients experienced decrease in consciousness level that CT scan changes were observed in 8 cases (61.5%). Of the 13 patients (19.4%) had CT scan changes, 5 (38.4%) ha brain structural lesions.
Conclusions: The prevalence rate of CT-scan changes was 19.4% and the most commonly detections in patients by CT scan, were structural disorder of the brain and subdural effusion.

Keywords: Ardabil, CT scan, Lumbar puncture, Meningitis

INTRODUCTION

The use of CT scan has grown dramatically in recent years and discuss about its risks has also increased. Multiple use of CT scan is associated with an increased risk of cancer in the future especially in children due to cellular growth and mutation.[1] Perform CT- scan before spinal cord puncture in children suspected of meningitis who have a disturbance in consciousness, has a relative indication and researchers recommend that due to usefulness of CT-scan in detecting child abnormalities especially the diagnosis of lumbar puncture contractions, which is necessary only in emergency cases with minimal dosage and at the least frequent because there is no need for multiple scans in children.[2,3]

Some studies indicated that one third of the performed CT-scans in children are unnecessary and removing them can reduce the risk of cancers in the future.[4,5] An increase in the use of CT scan and radiation dose in the population while happening that our understanding of X-ray carcinogenicity in children has been substantially

improved. Studies show that perform CT scan has more risk and side effects for a 10-year-old girl is twice as likely to be a 30-year-old woman and more than 5 times that of an 80-year-old woman.[6] The risk of leukemia in children under the age of 5 year who underwent CT- scan is higher than other children in this age group. So that 1.9 out of every 10,000 children under the age of 5 years of age are at risk for future malignancy.[7]

One in every 550 cases of CT scan on children's abdomen and pelvis will lead to cancer deaths.[8] The risk of radiation-dependent cancers such as leukemia and brain tumors is higher in brain scans which was the most commonly used CT-scan in children.[9] Perform CT-scan in children at risk of developing hernia complications due to lumbar puncture, is one of the main indication for CT-scan.[10] Problems in neurological examination especially in infants, lack of cooperate by infant, incorrect beliefs in society, physicians' concern about legal problems, the lack of facilities for performing an emergency CT scan in many parts of the country, costs and risks of unreasonable exposure to rays are some reasons for study the indications of brain CT- scans before lumbar puncture, especially in educational centers.[11] The aim of this study was to evaluate the results and indications of brain CT-scan before lumber puncture in children with suspected of meningitis hospitalized in Ardabil city hospital.

METHODS

Study design

This retrospective descriptive cross- sectional study has been done on 67 children who were hospitalized for meningitis and candidate for CT-scan before lumbar puncture in Ardabil city hospital in 2015.

Inclusion and exclusion criteria

All children hospitalized for meningitis and candidate for CT-scan before lumbar puncture were entered in the study and infants less than 18 months were excluded due to the lack of indication of CT scan before LP according to references (because of the openness of Fontana's).

Data Collection and statistical analysis

Demographic information, previous problems, patient symptoms and clinical examination findings, written reports of CT scans and other information were extracted and entered the checklist. Data were analyzed using descriptive and analytical statistical methods in SPSS version 22. The significance level was considered to be less than 0.05.

RESULTS

In this study, 67 children were enrolled. Changes in CT scan were seen in 13 patients (19.4%) that 6 (46.2%) of them were male and 7(53.8%) were female and the relation wasn't significant.

The average age in patients with CT scan changes was 36.9±2.14 months and in other patients was 38.8±3.56 months and there was no significant relationship between age and changes in CT scan. A decrease in consciousness was observed in 13 patients (19.4%) that of them, CT scan changes were seen in 8 patients (61.5%).

Table 1. Demographic and clinical finding information in study patients.

Changes in CT-Scan Variables		+(n=13)	(n=54)-	p-value
Sex	f	7 (53.8%)	26 (48.2%)	0.1
	m	6 (46.2%)	28 (51.8%)	
Mean of age		36.9±2.1	38.8±4	0.8
Loss of consciousness	+	8 (61.5%)	5 (9.2%)	0.01
	-	5 (38.5%)	49 (90.8%)	
Vomiting	+	3 (23.1%)	30 (55.6%)	0.2
	-	10 (76.9%)	24 (44.4%)	
Focal seizure	+	3 (23.1%)	1 (1.9%)	0.042
	-	10 (76.9%)	53 (98.1%)	
focal nerve symptoms	+	1 (7.7%)	2 (3.8%)	0.1
	-	12 (92.3%)	52 (96.2%)	

There was a significant relationship between decreased consciousness and changes in CT scan. Of all patients, 33 patients (49.3%) had vomiting that in 3 patients (9.1%) CT scan changes were observed.

There was no statistically significant relationship between vomiting and changes in CT scan. Of all patients, 4 (6%) had focal seizure of which 3 (75%) had CT scan changes. There was a significant relationship between focal seizure and changes in CT scan.

Of all patients, 3 (4.5%) had focal nerve symptoms of which 1 (33.3%) had CT scan changes. There was no statistically significant relationship between the

occurrence of focal nerve symptoms and changes in CT scan (Table 1).

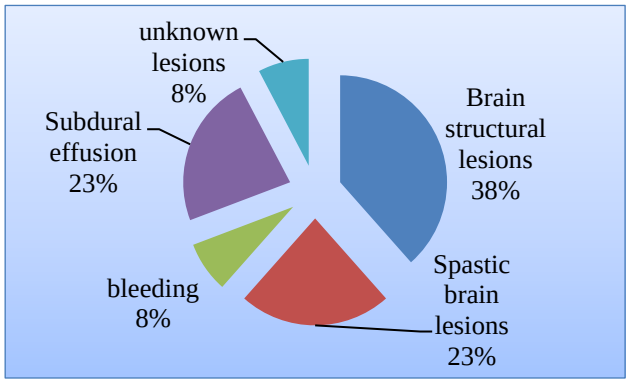

Figure 1. Frequency of CT-scan finding.

Of the 13 patients (19.4%) had CT scan changes, 5 (38.4%) had brain structural lesions (Figure 1).

DISCUSSION

In this study, the majority of patients were female which was similar in terms of sex distribution to Hamburg but did not match the Turkish study which was the most commonly reported case were boys.[12,13]

In the present study, symptoms such as increased intracranial pressure such as jumbo vomiting, decreased consciousness, generalized and focal and focal neuropathy were the criteria for CT scan. There was a significant relationship between CT scan findings and focal seizure, generalized seizure and decreased consciousness but no significant relationship between age and sex of patients and focal neurological symptoms and jumper vomiting.

In the study of nateghian et al, bad general situation, toxically and prominent figure as a criterion for CT scan was reported that the reason for this difference can be considered as a retrospective study of the present study which Nateghian's study was performed by obtaining a history and direct examination of patients.[11]

In the study of Tavanayi et al, the most important cause of CT scan was reported seizure.[10]

Among the significant mentioned factors, the level of consciousness reduction in most of the references has been reported as an important and acceptable finding for such a request but the range of the problem changed from thinking impairment to non-response to sound.[11] In this study, the result of CT scan in 19% of patients caused the lack of LP that the results of this study was not in line with the results of Nateghian and et al which it was reported at a rate of 14% and was slightly higher which in adults was less than 2%.[11]

The result of this study was not consistent with Tavanayi et al , which had 46.3% of CT scan changes.10 In various studies, the risk of brain hernia in patients with suspected meningitis was reported from 4% to 6% that most of them included adult patients and brain hernia is considered as a deadly complication follow LP and due to the prevalence of abnormal CT scans, the need for different studies to determine the exact indication of CT scan is necessary.[14-17]

In the current study of abnormal CT-Scan, most cases related to brain structural damage and subdural effusion that in the study of Tavanayi et al, the most common result of abnormal brain CT scan with 12% was hypodense lesions that wasn't in line with present study results.[10]

CONCLUSION

The results of this study showed that the prevalence of CT scan disorder was 19% and the highest CT scan finding in patients was brain structural damage and subdural effusion. There was a significant correlation between CT scan findings and generalized seizures and focal and decreased consciousness. Doing cohort studies to determine the exact CT scan indications before performing LP in children suspected of meningitis and prospective studies taking into account the results of the current study and other studies to study the effects of these studies on reducing the use of unnecessary CT scan are recommended.

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Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Farnoodi MR, Kamali K. Evaluation of CT necessity in under 18 years old patients in shiraz namazi hospital. Shiraz University of Medical Science. 2013.
2. Goske MJ, Applegate KE, Boylan J, Btler PF. Callahan MJ, Coley BD, et al. The Image Gently campaign: working together to change practice. AJR Am J Roentgenol. 2008;190:273-4.
3. Pearce MS, Salotti JA, Little MP, McHugh K, Lee C, Kim KP, et al. Radiation exposure from CT scans in childhood and subsequent risk of leukaemia and brain tumours: a retrospective cohort study. The Lancet. 2012;380(9840):499-505.
4. Brenner DJ, Hall EJ. Computed tomography- an increasing source of radiation exposure. N Engl J Med. 2007;357(22):2277-84.
5. Slovis TL. Children, computed tomography radiation dose, and the as low as reasonably achievable (alara) concept. Pediatr. 2003;112(4):971-2.

6. Shuryak I, Sachs RK, Brenner DJ. Cancer risks after radiation exposure in middle age. J Natl Cancer Inst. 2010;102:1628-36.
7. Miglioretti DL, Johnson E, Williams A, Greenlee RT, Weinmann S, Solberg LI, et al. The use of computed tomography in pediatrics and the associated radiation exposure and estimated cancer risk. JAMA Pediatrics. 2013;167(8):700-7.
8. Brenner D, Elliston C, Hall E, Berdon W. Estimated risks of radiation-induced fatal cancer from pediatric CT. AJR Am J Roentgenol. 2001;176(2):289-96.
9. Kuppermann N, Holmes JF, Dayan PS, Hoyle JD, Atabaki SM. Holubkov R, et al. Pediatric emergency care applied research network (PECARN). Identification of children at very low risk of clinically- important brain injuries after head trauma: a prospective cohort study. Lancet. 2009;374(9696):1160-70.
10. Sani TA, Farokh D, Naderi H, Esmaeili H, Abasian S, Mohamadi kH. Brain computed tomography scan in meningitis patients with deterioration of consciousness. Med J Mashhad University of Med Sci. 2011;54(2):105-12.
11. Nateghian AR, Nojomi M, Rad MM. Evaluation of criteria for requesting brain CT scan before performing lumbar puncture for the children suspicious to meningitis in rasul Akram Hospital, Tehran. AJCM. 2005;12(1):19-24.
12. Weber C, Grzyska U, Lehner E, Adam G. Clinical relevance of cranial CT under emergency conditions--basic neuroradiologic investigations. RoFo: avances en el campo de los rayos X y la medicina nuclear. 2003;175(5):654-62.
13. Ozmen M, Tatli B, Aydinli N, Caliskan M, Demirkol M, Kayserili H. Etiologic evaluation in 247 Children with global developmental delay at Istanbul, Turkey. J Trop pediatr. 2005;51:310-3.
14. Prober CH. Central nervous system infections. In: Behrman, Klieman. Jenson's Nelson textbook of pediatrics. Philadelphia: WB Saunders. 2004:2038-44.
15. Archer B. Computed tomography before lumbar puncture in acute meningitis: a review of the risks and benefits. Can Med Assoc J. 1993;148(6):961-5.
16. Gopal A, Whitehouse J, Simel D. Cranial computed tomography before lumbar puncture: a prospective clinical evaluation. Arch Intern Med. 1999;159:2681-5.
17. Linden CH, James W, Hartigan C. Cranial CT scan prior to LP in patients with suspected meningitis. Paper presented at: annual meeting of the massachusetts college of emergency physicians. Boston, Massachusetts. 1994.

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